
**TRIBHUWAN UNIVERSITY**

**INSTITUTE OF ENGINEERING**

**PASHCHIMANCHAL CAMPUS, POKHARA**

**Lamachaur-16, Pokhara**

[EX 652]

# A MINOR PROJECT REPORT ON

# "SMS BASED VEHICLE TRACKING SYSTEM"

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**SUBMITTED TO:**

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FALGUN, 2080

# LETTER OF APPROVAL

PASHCHIMANCHAL CAMPUS

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

The undersigned certify that they have read and recommended to the Institute of Engineering for acceptance, a project report entitled "SMS BASED VEHICLE TRACKING SYSTEM" submitted by Amrit Giri, Ashwin Adhikari, Kiran Subedi, Nishanta Sharma Chapagain in partial fulfillment for the degree of Bachelor of Engineering in Electronics and Communication Engineering.

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# COPYRIGHT

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**"SMS BASED VEHICLE TRACKING SYSTEM"**

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Sincerely

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# ABSTRACT

It remains important to have security frameworks these days to shield from losing it or from harm. The significant goal is to make a security framework for every one of the vehicles. Brilliant vehicle global positioning framework is intended for following the development of the vehicle outfitted with planned framework for any area whenever. Henceforth, guaranteeing the security on the off chance that it is lost or harmed. In this Mini Project, the global positioning framework involves basic module like Microcontroller board-Arduino UNO, GPS receiver-neo 6m component and SIM 800L GSM module. The world-wide locating scheme-GPS and world-wide scheme for cellular transmission-GSM advancements are the most widely recognized strategies utilized for following the vehicles. The GPS module is utilized to get the area data i.e., geographical directions where the vehicle is arranged at that specific time. The capacity of the GSM module is moving the information and overhauling the data. The vehicle area is gained through SMS by means of GSM module. The microcontroller board-Arduino UNO gets the area arranges from the GSM module and communicates the data to the client. The client can get to the area utilizing Google maps in the versatile. The client can arrive at their vehicle inside less time and this framework can likewise be utilized for crises. The framework gives the continuous vehicle area and continuous observing of the vehicle and development cost is less.

***Keywords****: Arduino UNO, Buck converter, GPS module, GSM module, mobile*

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| DC | Direct Current |
| EEPROM | Electrically Erasable Programmable Read-Only Memory |
| GSM | Global System for Mobile Communications |
| GPS | Global Positioning System |
| IDE | Integrated Development Environment |
| IOT | Internet of Things |
| M2M | Machine-to-Machine |
| MHz | Megahertz |
| PWM | Pulse Width Modulation |
| SMS | Short Message Service |
| SRAM | Static Random-Access Memory |
| UML | Unified Modeling Language |
| VIN | Vehicle Identification Number |

# INTRODUCTION

## 1.1 Background

“Vehicle Tracking System” by using GPS and GSM is a simple and cost-effective method for tracking the location of the vehicle. Vehicle theft is becoming the major issue in today's modern world. The vehicles are not safe wherever we park them, which can create a big loss by the missing vehicle. It is important for the Vehicle Company and owner to protect their vehicle from theft. The tracking system used in vehicles will also assist the people while using public transportation as they will get the information about the location of vehicle. In addition, the tracking system used in vehicles will also help in the management of traffic.

The security of their property is the major issue for the owner of every vehicle. As we know a second of time is important in this modern world and everyone wants to save time while traveling. So, a solution for the theft of vehicles and finding the location of them is necessary.

We can solve this by using GPS and GSM to track the location of vehicles and send the location to the owner or the public. GPS will help to know the coordinates of the vehicle at regular time and GSM will update the location to the database. Here GPS and GSM are the modern technologies which are used to track the location at an instant. [1]

## 1.2 Problem Statement

Vehicle Tracking System is usually done by using Vehicle Identification Number (VIN). Though the VIN is an essential identifier for a vehicle, it does not provide a real time location-tracking system. For tracking the vehicle using VIN, we need to be near the vehicle to identify if the vehicle belongs to us. The tracking of public vehicles and management of the traffic is totally impossible by only using VIN. If we only use VIN while tracking vehicles then it will be time consuming. So in order to tackle all the problems and challenges above, Vehicle Tracking System using GPS and GSM should be used so that it can provide real time location.

## 1.3 Objectives

To route, track and know location of vehicles in a large area environment based on the Global Positioning System (GPS) and Global System for Mobile Communication (GSM).

## 1.4 Project Features

Some of the main features of our project are:

**Cost**: Vehicle Tracking System using GPS and GSM is relatively economical.

**Time**: This system is less time consuming and reliable.

**Coverage**: The range of GPS and GSM is all over the world.

## 1.5 Scope

This project is purely intended for educational and research purposes and has commercial application. This project can be commercialized and can be used in tracking of the vehicle.

## 1.6 Applications

Vehicle tracking systems have versatile applications across industries. They optimize fleet management by providing real-time location tracking, enabling efficient route planning, and reducing operational costs. In logistics, these systems enhance supply chain visibility and improve delivery schedules. For personal use, they enhance security by tracking stolen vehicles. In construction, they manage equipment and prevent unauthorized use. Insurance companies use tracking data for usage-based insurance and claims processing. Emergency services benefit from quick vehicle location during crises. In smart cities, tracking systems aid traffic management and urban planning. E-commerce relies on them for last-mile delivery efficiency. Small businesses benefit from improved operational and cost efficiency, making vehicle tracking systems an invaluable tool across various sectors. [3]

## 1.7 Motivation

lmplementing a vehicle tracking system in our small business holds immense potential for transformative benefits. This project promises to enhance operational efficiency by providing real-time insights into our vehicle's location, enabling optimized route planning and reducing fuel costs. Moreover, the system's security features will protect our valuable assets, mitigating the risk of theft and facilitating quick recovery in case of any untoward incidents.

# LITERATURE REVIEW

The review has been made for finding the accurate position of moving vehicles using IOT. The bus tracking system is based on a GPS and manual framework intended to show the ongoing area. The framework requires a working association and may or may not be a GPS tracker. This framework consisted of a transmitter introduced on the vehicles and recipient. The framework is worked by GPS which is appended with each vehicle. It uses external hardware and software implementation. The function of these GPS tracking devices is to collect the data to get better the efficiency, safety of the people and also the overall functionality. These live tracking are also used in IOT. The web-of-things is the entomb working of bodily gadgets, vehicles, structures and dissimilar things done with hardware, programming, sensors and system network and consequently. IOT additionally expected propelled network gadgets, frameworks and administrations that go past M2M communication. [4]

Continuous Bus Monitoring System utilizing GPS shows the present areas of the transport. The framework consisted of a transmitter introduced on receiver boards installed on the transports and recipient sheets introduced on the bus stations. It gave important transport courses and other data to their customers. [2]

A GPS based following framework is anticipated which monitors the area of a vehicle and its velocity dependent on a cellphone content informing framework. Obtain the present GPS location of the vehicle and send SMS to the framework. Get the present area of the vehicle whenever. This framework gives a confined way to deal with track and keep on their vehicle. The proprietor can Get the present area of the vehicle whenever. Obtain the present GPS directions of the vehicle to identify unapproved development. [5]

# REQUIREMENTS

## 3.1 Hardware Requirements

### 3.1.1 Arduino UNO

A popular microcontroller board in electronics projects, prototyping, and educational contexts is the Arduino Uno. It is built on the 8-bit ATmega328P microcontroller, which has 1KB of EEPROM for data persistence, 2KB of SRAM for variable storage, and 32 KB of flash memory for program storage. The Arduino Uno has 14 digital input/output (I/O) pins, including 6 PWM outputs, and a number of analog input pins, and its clock frequency is 16MHz. The Arduino Uno is a flexible and affordable platform for creating interactive projects and learning about electronics and programming thanks to these characteristics. [6]

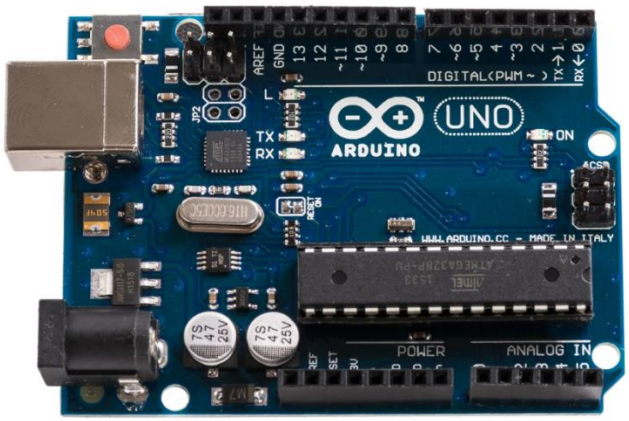



Fig 3.1 Arduino UNO

### 3.1.2 Buck Converter

A buck converter or step-down converter is a DC-DC converter which decreases voltage, while increasing current, from its input to its output. It is a class of switched-mode power supply. Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that dissipate power as heat, but do not step up output current.


Fig 3.2 Buck Converter

### 3.1.3 GPS MODULE

GPS module is a wireless chip module combined on the mainboard of a mobile phone or machine. It can communicate with the global satellite position system in the US. It can locate and navigate according to the condition of a wireless network signal. [2]

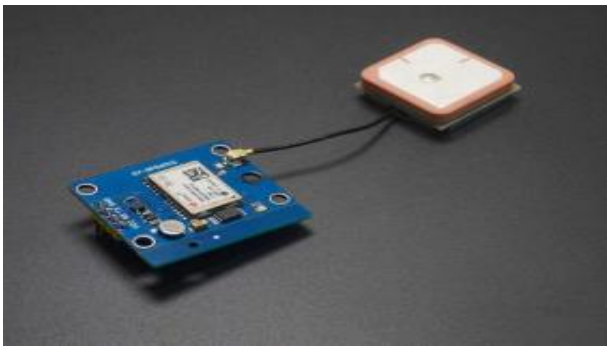


Fig 3.3 GPS Module

### 3.1.4 GSM MODULE

A GSM module is a device that allows electronic devices to communicate with each other over the GSM network. GSM is a standard for digital cellular communications, which means that it provides a platform for mobile devices to communicate with each other wirelessly. The GSM module is a specialized device that enables a device to send and receive data over the GSM network. [7]


Fig. 3.4 GSM Module

## 3.2 Software Requirements

### 3.2.1 Arduino IDE

The Arduino IDE (Integrated Development Environment) is a software tool used for programming Arduino boards. It provides an intuitive and user-friendly interface that simplifies the process of writing, compiling, and uploading code to Arduino microcontrollers. Here are key aspects of the Arduino IDE:

**Code Development**: The Arduino IDE allows users to write code in a variant of the C++ programming language, specifically tailored for Arduino boards. It provides a set of built-in functions and libraries that make it easier to interact with the board's hardware components. [8] The IDE offers features like syntax highlighting, auto-completion, and code suggestions, which aid in writing and editing code.

**Board Selection and Upload**: The Arduino IDE supports a wide range of Arduino board models. Users can select the appropriate board from the menu, specify the communication port, and upload their compiled code directly to the board. The IDE handles the compilation process and provides feedback on any errors or warnings that may occur during compilation or upload.

**Libraries and Examples**: The Arduino IDE includes a library manager, which allows users to easily add external libraries to their projects. [6] These libraries provide pre-written code for common tasks or specific hardware components, saving time and effort. Additionally, the IDE provides a collection of example sketches that demonstrate various functionalities and serve as a starting point for beginners or those looking for inspiration.

Overall, the Arduino IDE serves as a comprehensive development environment for programming Arduino boards. It enables users, regardless of their programming experience, to write, compile, and upload code to Arduino microcontrollers, making it accessible for both beginners and experienced developers alike.

### 3.2.2 Django

Django is a high-level Python web framework encouraging rapid development and clean design. In this particular project, the utilization of Django was focused on its capabilities to interact with Twilio, a prominent virtual number provider. Within this context, Django facilitated the retrieval of data from Twilio, comprised of latitude and longitude coordinates. These coordinates are subsequently processed and transformed into a JSON file, thereby rendering them accessible via the designated endpoint at '/receive location/'. Here, the JSON file serves as a crucial data source for plotting points on a map, providing a visual representation of the geographic data obtained from Twilio.

Moreover, to ensure code readability to establish programming conventions, we employed black, flake8 and isort to maintain consistency and clarity throughout the codebase. In addition to code formatting, the project leveraged Celery, a powerful task queue, to orchestrate background processes. Specifically implemented for periodic refreshing of data from Twilio through the '/incoming_sms/' endpoint.

# SYSTEM DESIGN AND ARCHITECHTURE

## 4.1 Block Diagram

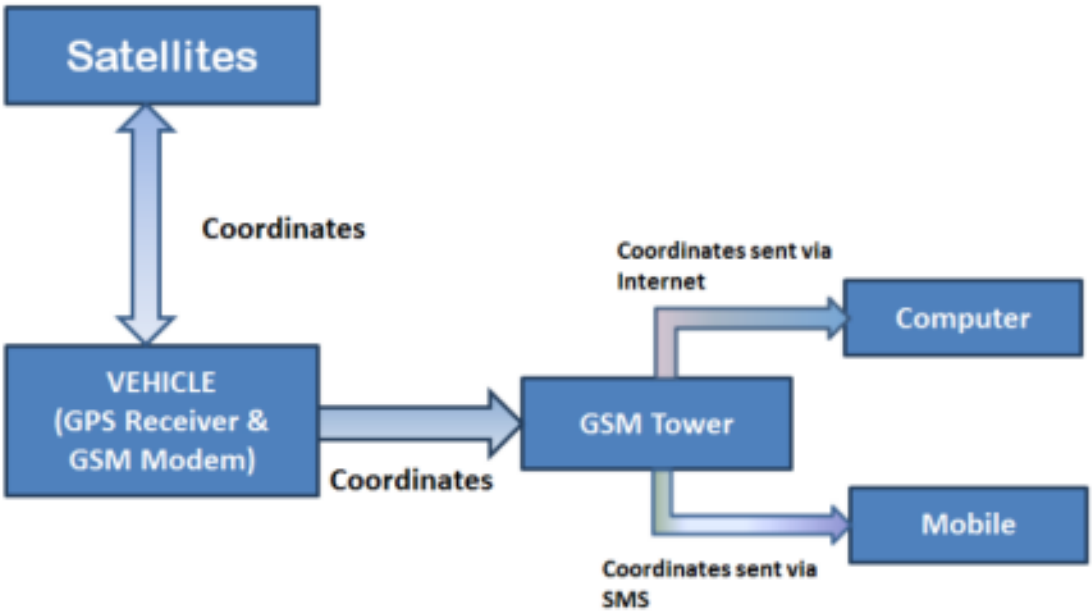



Fig. 4.1 System diagram of location tracking

GPS module communicates with GPS satellite to get location data which it sends to GSM. GSM then connects with the preferred network, basically 2G network for SIM 800L module. The data is sent to given mobile number as a SMS through GSM. And the location obtained can be integrated with Google maps to view the location. [8]

## 4.2 Flowchart

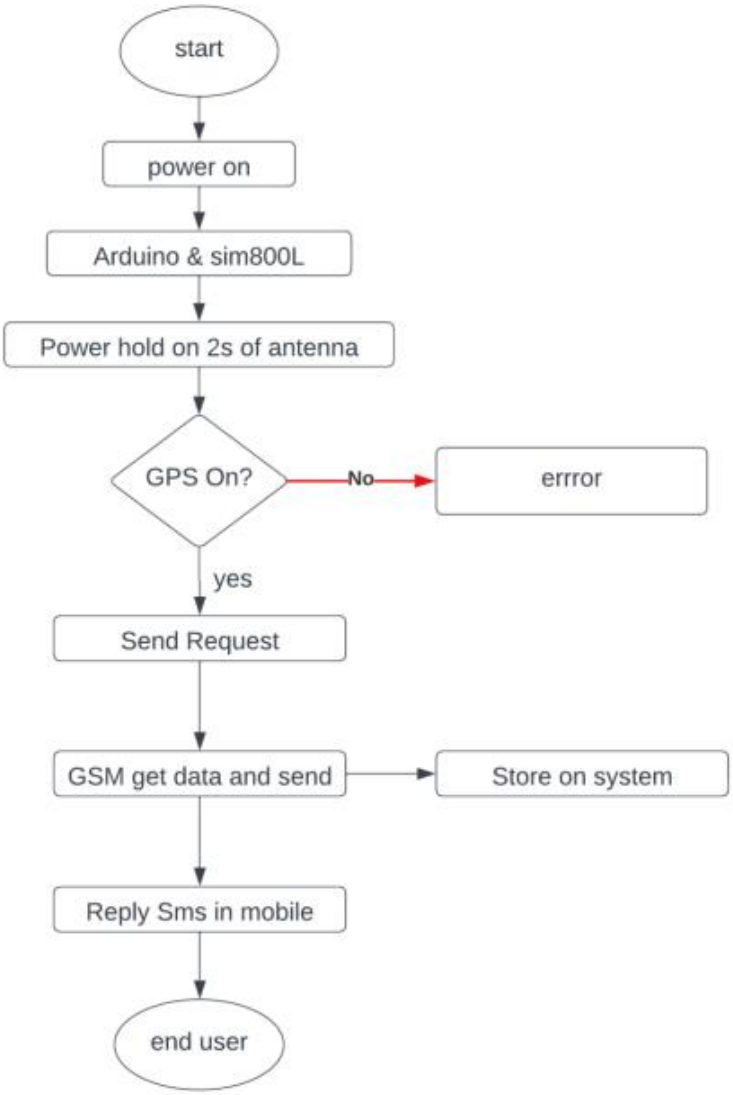



Fig. 4.2 Flowchart

This flowchart outlines the basic steps of SMS based vehicle tracking system, emphasizing the interaction between Arduino, SIM 800L GSM module and NEO 6M GPS module. The system continuously loops through these steps to ensure real time tracking and responsiveness to commands.

## 4.3 UML Diagram

### 4.3.1 Use Case Diagram

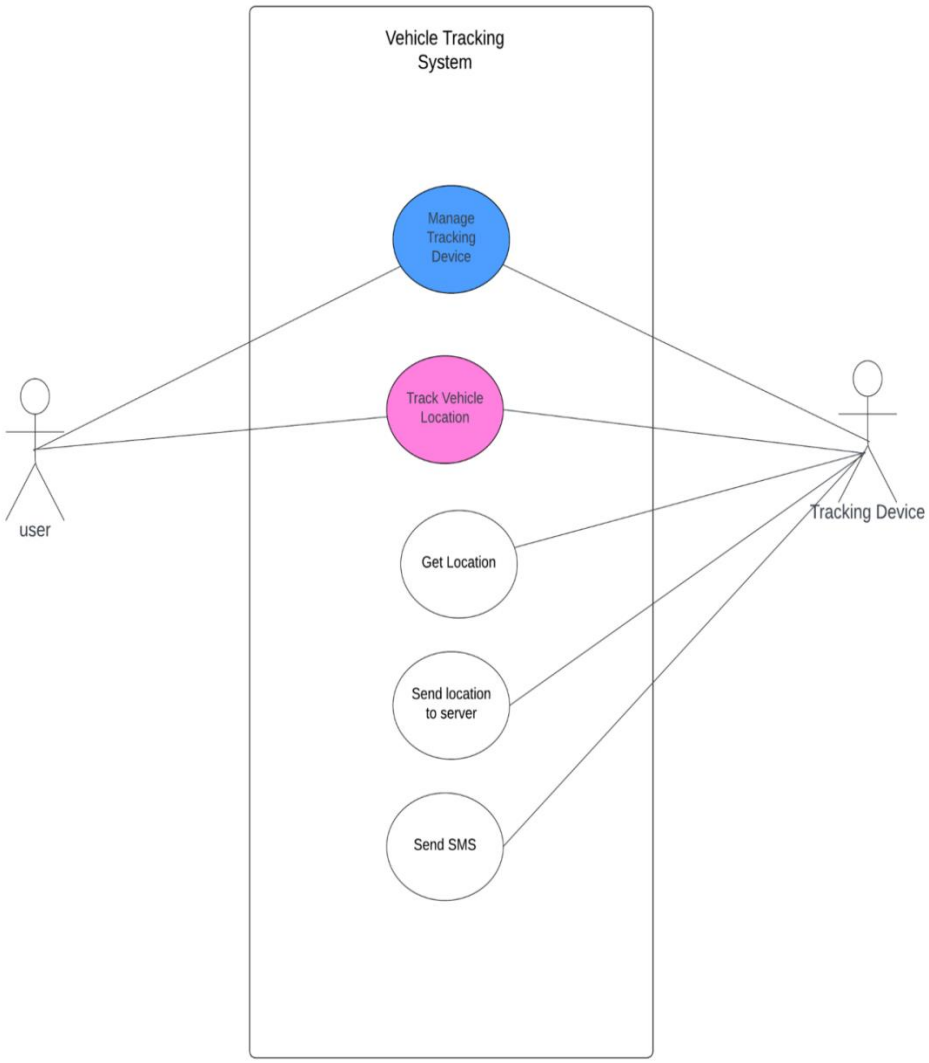



Fig. 4.3 Use case diagram

### 4.3.2 Activity Diagram

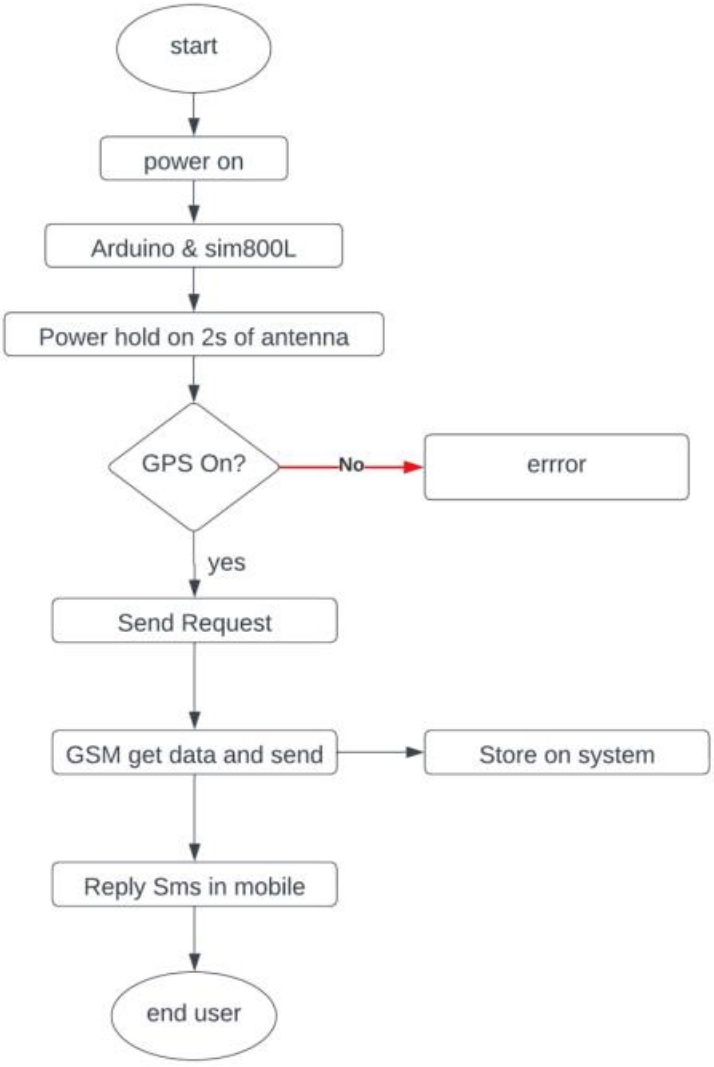



Fig. 4.4 Activity diagram

### 4.3.3 Class Diagram

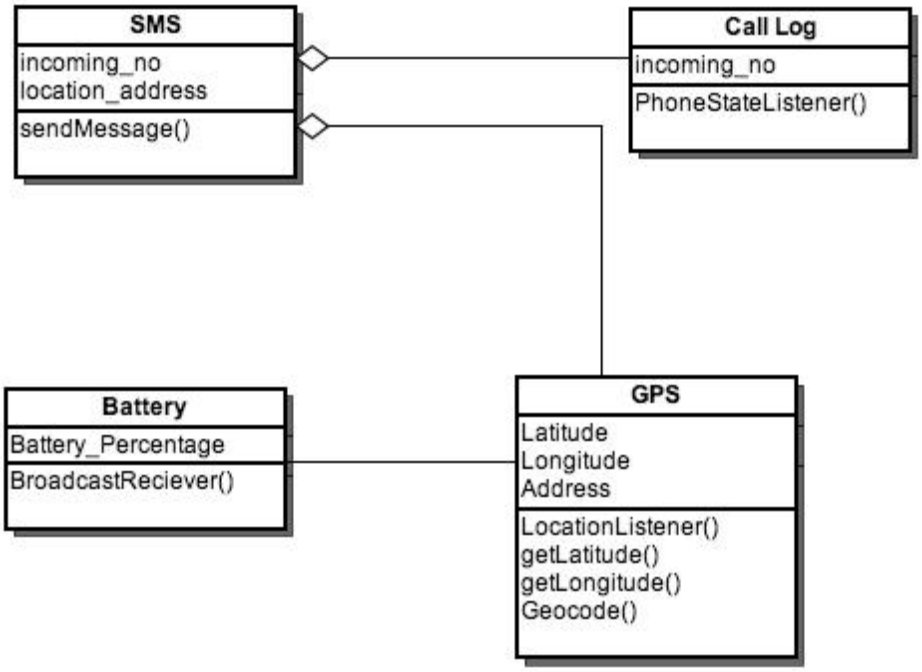



Fig. 4.5 Class diagram

# METHODOLOGY

## 5.1 Methodology

This methodology combines the use of GPS and GSM technology for collecting the data to track the vehicle. GPS provides the live location of the vehicle and GSM transmits and updates the vehicle location to database. An Arduino UNO is used to control the GPS receiver and GSM module. [9] The block diagram below explains the working of the system. It consists of two sections, first of which will be inbuilt in the car which is having GPS in it and as the car moves the location of the car goes on changing continuously, the GPS find the location in terms of two coordinates that are longitude and latitude. These coordinates are connected to another section by GSM modem, as shown in the block diagram both the parts consist of GSM for communication. [4] The GSM is connected to a smartphone and a computer as well. The computer should be connected to the internet to know the location whereas the location will be sent to the smartphone in the form of SMS.

## 5.2 Hardware design

The required components are Arduino UNO, GPS module, GSM module, Buck converter.

The circuit design is:

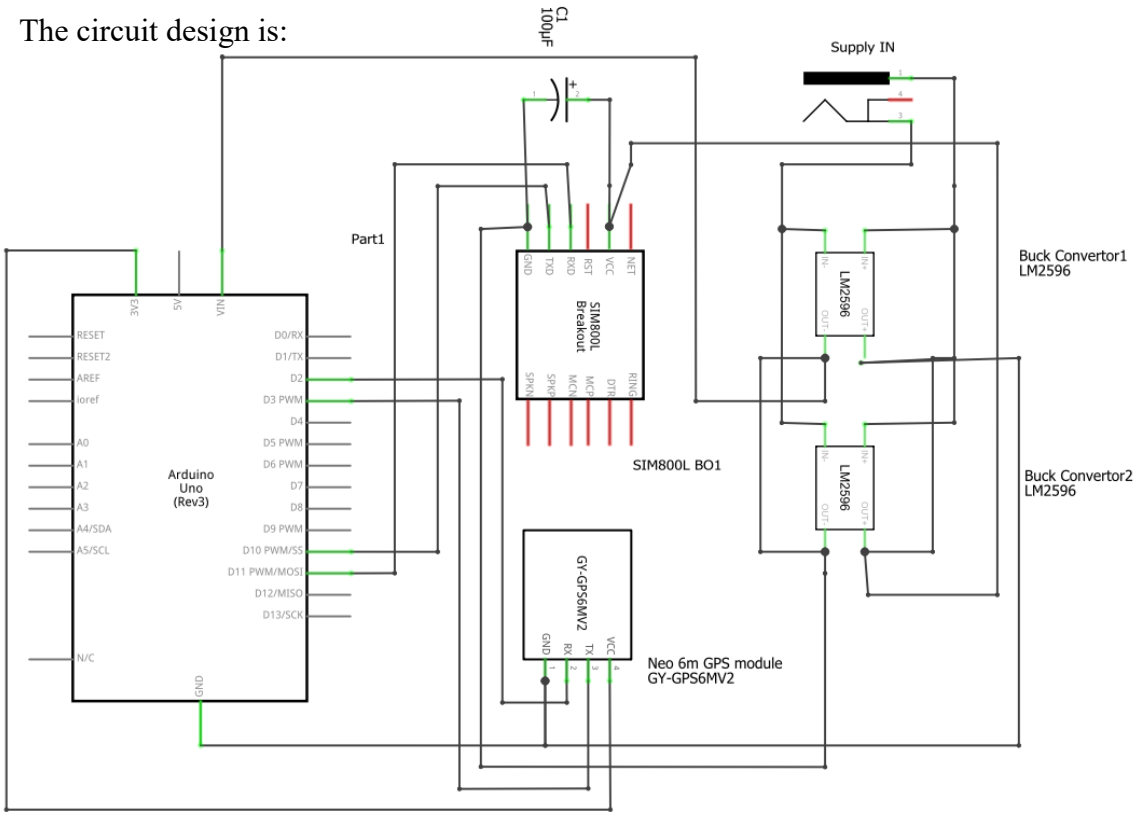



Fig. 5.1 Circuit design

The simple hardware assembling can be shown as:

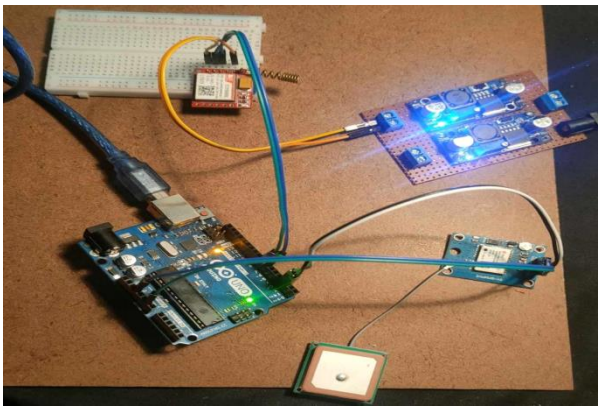
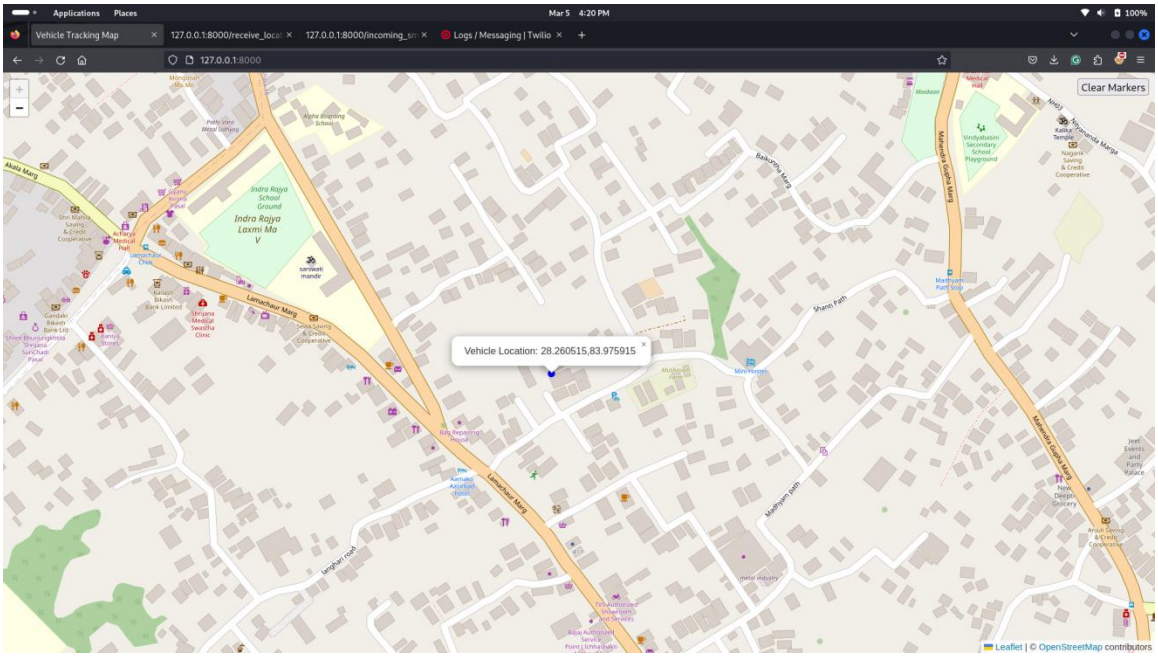


Fig. 5.2 Hardware Implementation

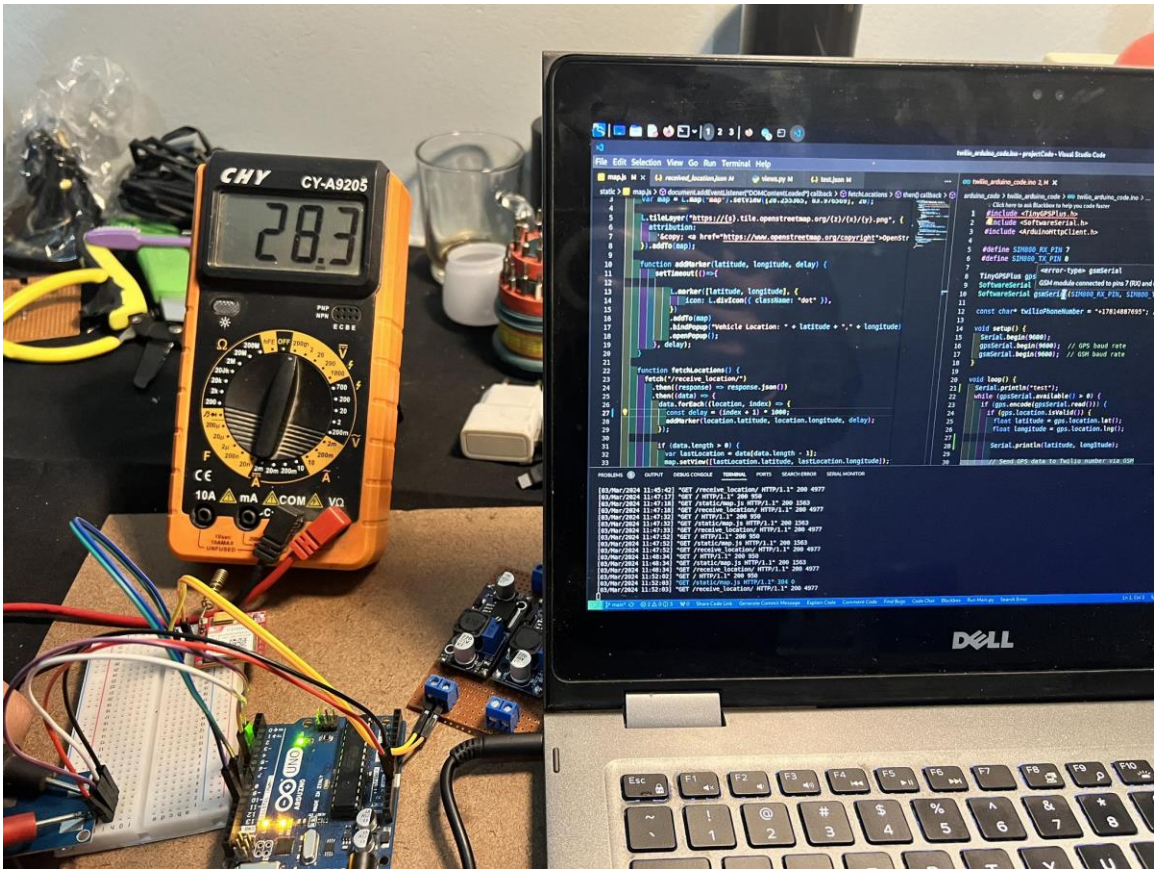
# RESULTS AND FUTURE PLANS

## 6.1 Results

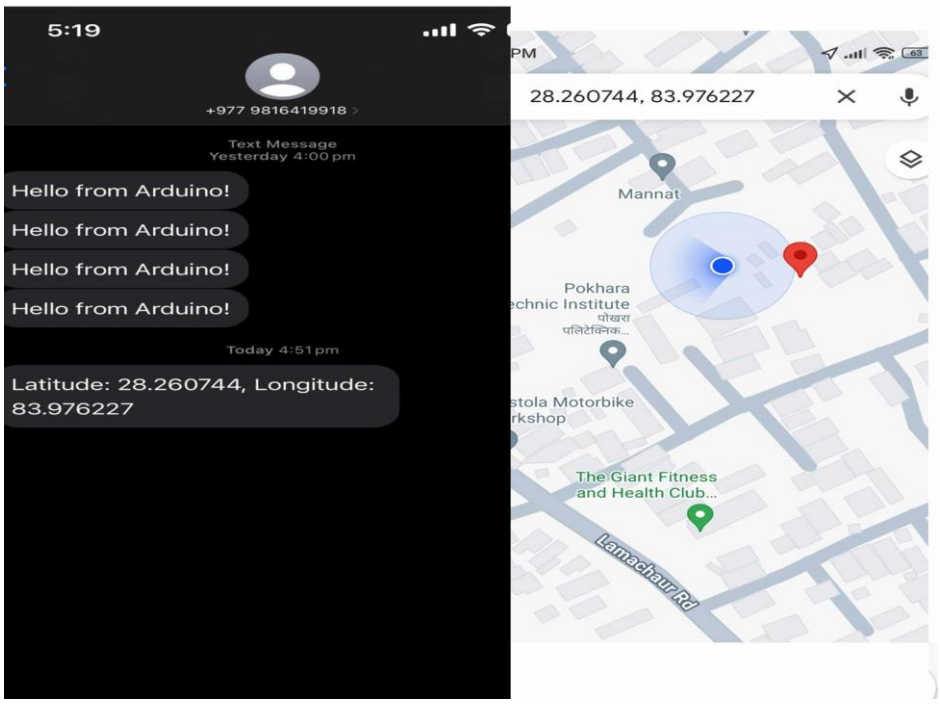
- The SMS based Vehicle Tracking System was successfully implemented. The integration of GSM and GPS facilitated seamless communication between the tracking module and the SMS gateway. Despite minor challenges during implementation, such as failure to send message, the system demonstrated robust functionality.



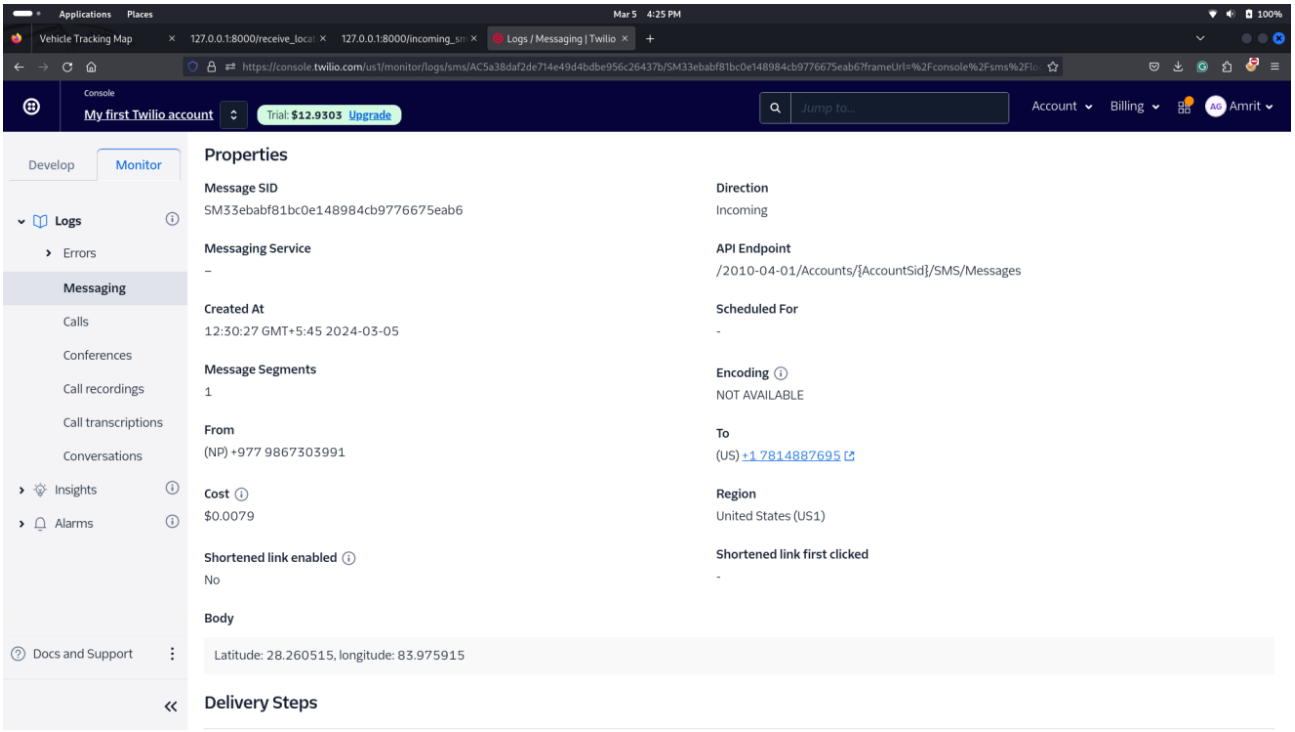
- In testing the basic functionality, the SMS based Vehicle Tracking System exhibited reliable performance. SMS queries sent to the system produced accurate and real-time location updates for the tracked vehicles. The integrity of the data collected and processed by the system was maintained throughout the testing phase. No instances of data corruption or loss were observed.



- The system showcased commendable accuracy and precision in vehicle tracking. Deviations from the expected results were minimal.




- The response time of the system to incoming SMS queries met the defined performance standards.



## 6.2 Future Plans

Looking forward, our plans for the SMS based Vehicle Tracking System involve making it better and more useful. We want to handle more vehicles and users smoothly by improving the system's technology. We'll also work on making it even easier for users to understand and use.

In the future, we aim to add smart features like predicting the best routes for vehicles. This helps save fuel and money. We're also thinking about adding more ways for users to interact with the system, like using mobile apps and websites.

This will give them more options to get information about tracked vehicles. We're not stopping there – we plan to explore new technologies like Internet of Things (IoT) and work with other companies to bring in more data and features. Our goal is to expand the system to different areas and work closely with authorities to make it part of a larger transportation network. In a nutshell, our future plans are all about making the SMS-based Vehicle Tracking System smarter, more user-friendly, and useful for a wider range of situations and locations.

# CONCLUSION

## 7.1 Conclusion

In conclusion, the SMS based Vehicle Tracking System represents a successful endeavor in providing a simple, accessible, and effective solution for vehicle monitoring. Throughout the project, we achieved a reliable and user-friendly system, allowing individuals to track vehicles seamlessly through SMS queries.

The positive results from testing, user feedback, and system performance reinforce the viability and potential impact of this solution. We acknowledge certain limitations, such as dependency on SMS infrastructure and scalability challenges, and recognize the importance of addressing these aspects in future iterations.

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